TECHNOLOGY DEPT.

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LI
No. 1313

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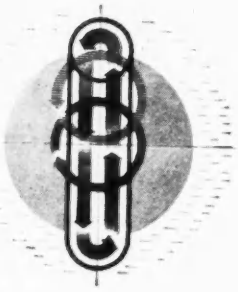

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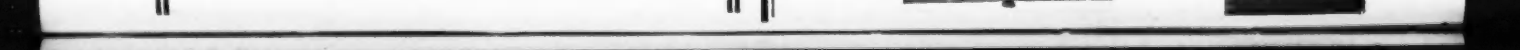

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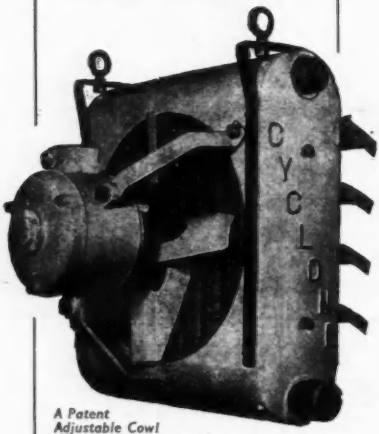

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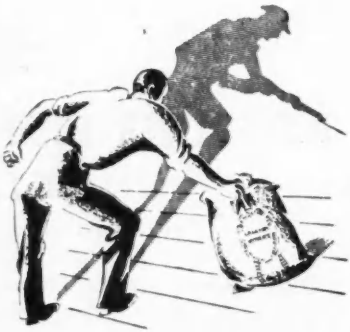

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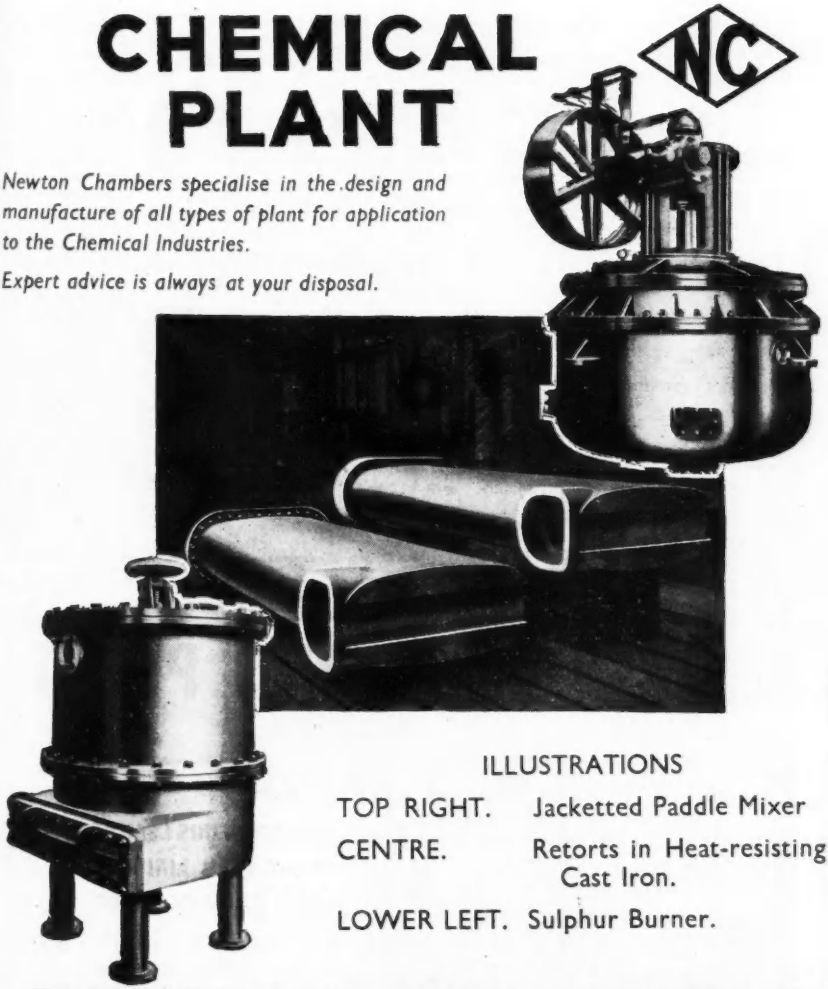

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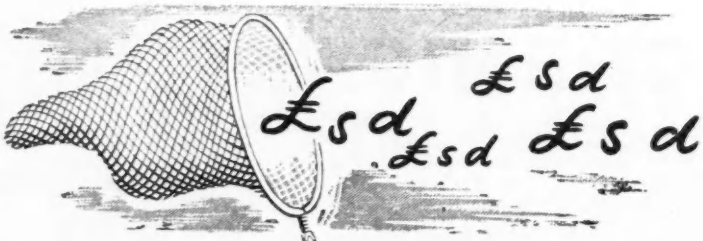

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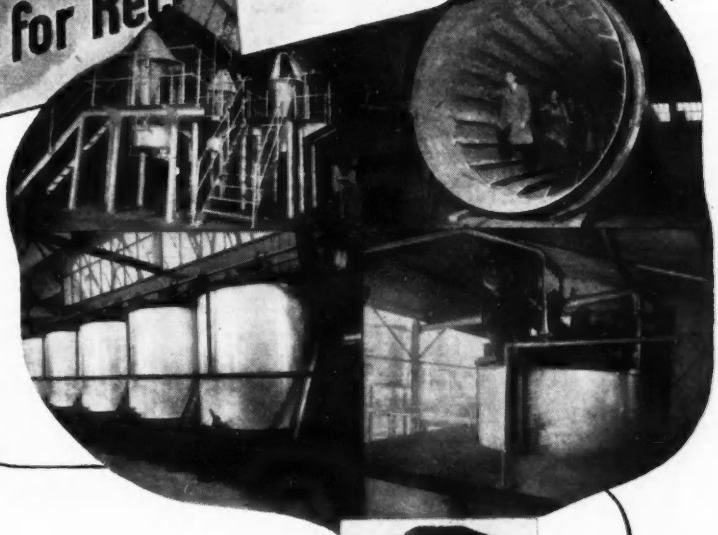

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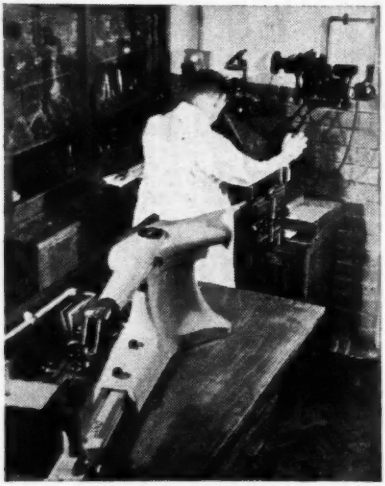

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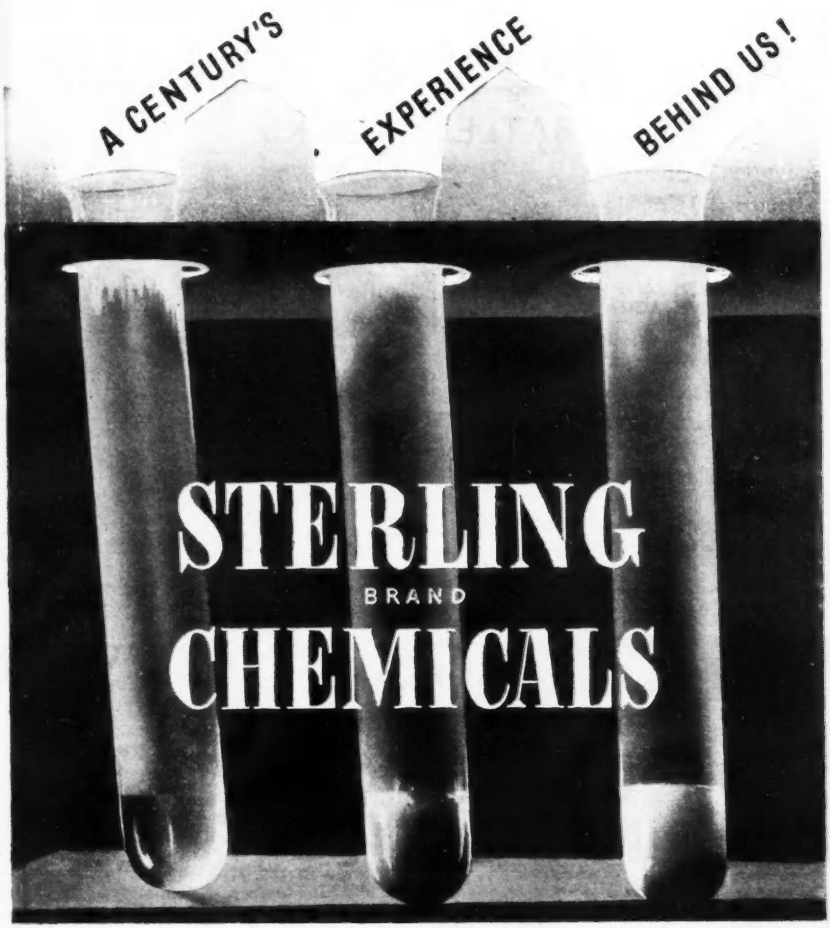

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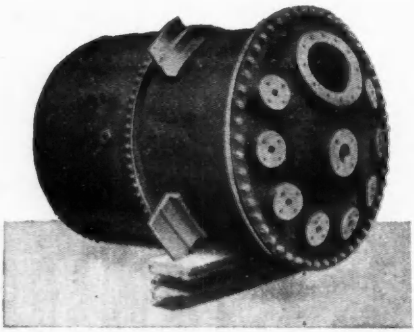

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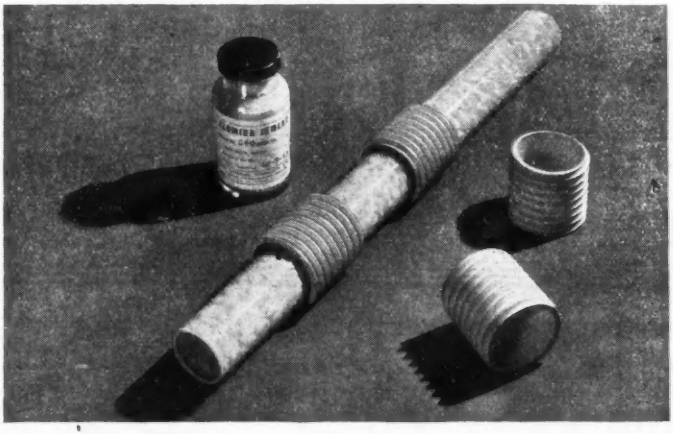

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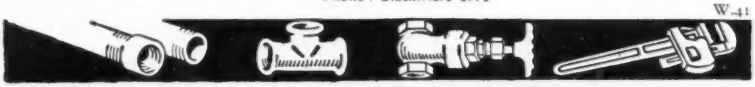

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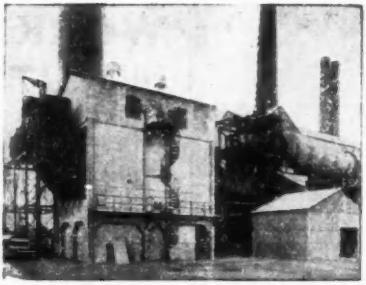

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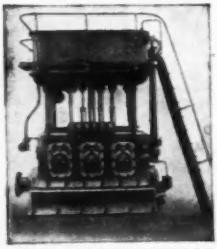

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August 26, 1944

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Making Both Ends Meet

IT will be a long time before we forget the events of the uneasy period between the two wars. Many nations and many industries finding themselves with surplus capacity or with surplus production jumped to the conclusion that, because they were producing or able to produce more goods than the world would buy from them, the disease which afflicted commerce was one of over-production. Having arrived at this conclusion, they took, in many instances, measures to meet the situation by quotas of production in manufacturing industries and by wanton destruction of products in agricultural industries. It took us some time to diagnose our complaint accurately as one of under-consumption, and even to-day we cannot feel sure that we have as yet found the cure. This was the purpose of the Hot Springs Conference and of many other international conferences, all of which have in view the increase of consumption coupled with such regulation of production as may be essential in order that there shall not be depressed industries or depressed areas and that there shall be full employment for all.

One example of the sort of arrangement that is being made occurs in the sugar industry. The processing of sugar may fairly be regarded as a branch of the chemical industry, although a large and specialised branch which has its own trade associations, its own technical press, and its own technical bodies. Before the war sugar was produced in huge overseas areas which, if fully developed, could have supplied all the sugar that the world needed at a very low price. For various reasons, many of them not unconnected with the threat of a renewal of hostilities, all large sugar-consuming countries began themselves to grow sugar beet and to set up their own sugar industry. The result was that sugar was produced at a higher price than was necessary by people who could very well have been producing something else, and the world's cane-sugar estates had to cut down production. Some of the countries which produced beet sugar made themselves self-supporting; others even entered the world's export markets in sugar. The competition of the much cheaper cane-sugar was kept down by tariffs and other protective methods. To such an extent was the position "regulated" by these actions of governments that out of a total production of 30 million

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tons of sugar before the war only 3 million tons provided a free market.

The international sugar agreement was the first international government scheme to bring the main producing and consuming countries together, but its purpose was limited to the maintenance of equilibrium between supplies and demand on the free market. Thus, since it concerned only 10 per cent. of the whole world production, it did not get down to the roots of the problem. This problem is essentially one of underconsumption. Great Britain and the U.S.A. used to consume well over 100 lb. of sugar per head of the population per annum, whereas countries like France and Germany consumed only about half this quantity, Eastern Europe less than 25 lb. a head, and the huge and densely populated areas of Asia not more than 20 lb. per head. Improved nutritional standards were approved at Hot Springs and the obvious solution to the problem of sugar production is a higher standard of living to bring the rest of the world up to the 100 lb. per head of the countries where the standard of living is the highest.

It seems possible that another solution of the sugar production difficulty would be the greater industrial use of sugar. When a particular market becomes saturated, the wise manufacturer looks for other markets and other uses for his products.

Research institutes are now engaged in investigations which it is hoped, will lead to a greater industrial demand for sugar. Sugar is an organic body which should be susceptible to chemical transformations enabling other products of value to be manufactured from it. In America research aimed at finding new industrial uses for sugar is under way, and big developments can be expected. Similar steps are being taken in Britain so that our sugar-producing colonies shall have new outlets for their crop. The Colonial Products Research Council is giving attention to the matter, and research done under its auspices has already led to provisional patents for preparing simple sucrose derivatives which have uses in the plastics industry.

Another substance in which a similarly different position has arisen is that of rubber. Here the problem is even more complicated and delicate, because of the interposition of synthetic rubber. The productive capacity of the synthetic-rubber industry at the end of the war will be almost as large as that of the rubber plantations. The synthetic-rubber works are situated in the leading consuming regions which were the main markets for the output of the rubber plantations. With the exception of Brazil, no country producing crude natural rubber at present offers a big home market for the product. Thus it is essential that there should be co-operation between consuming areas and producing areas in order to avoid the difficulties which must inevitably arise if there is no regulation. It is hardly conceivable that "regulation" can be successfully built upon a policy of restriction of production, in the light of our previous experience of this policy.

Fortunately, it seems likely that international co-operation will be forthcoming. The Ministry of Supply has announced that officials of the British, United States, and Netherlands Governments have completed exploratory conversations in London on post-war rubber problems, in which they were assisted by members of various branches of the industry. A comprehensive survey was made of the rubber situation, covering both natural and synthetic rubber. A full exchange of views took place, and a large measure of agreement was reached on the broad outline of the position, and on the nature of the problems that lie ahead. It was recognised that these problems were matters of common concern to the three Governments. A first programme of studies has been prepared and arrangements for carrying out these studies are being made. The conference also considered the best way of securing continuing examination and further discussion of the problems likely to arise, and it was agreed to resume the conversations soon.

It is in such fields as this that Government action for the regulation of production and for the furtherance of industry is likely to be most fruitful. The war will leave us many vast problems, and it is encouraging to find that the manner in which these problems are to be solved is already being laid down before the problems come upon us in an aggravated form.

NOTES AND COMMENTS

United Nations Standards

LAST week we published a brief note about the United Nations Standards Coordinating Committee which was established recently. More details about its aims and objects have since come to hand. The committee, which was formed after consultations held in America last winter between representatives of British, United States and Canadian standards bodies, found its origin in the recognition that the needs of post-war reconstruction demanded that the United Nations make the utmost endeavour to coordinate as many as possible of their respective industrial standards so as to permit their industries to supply the devastated countries with goods of the right type, right that is in both quality and dimensions. The co-ordination at which the committee aims will include agreed methods of expressing and testing the properties of materials, the performance of machines and apparatus, as well as dimensional standards to secure interchangeability where the replacement of wearing parts is an important consideration.

The International Aspect

THE membership of the committee is to consist of representatives of the national standards bodies of the United Nations. Those of Great Britain, U.S.A., Canada, Australia and South Africa have already agreed to participate in, and financially support the committee. An invitation to co-operate in this work has been sent to the U.S.S.R. All-Union Standards Committee through the Union's Embassy in London. As regards those countries now under enemy occupation, it is intended that until such time as their territories are liberated and their national standards bodies are in a position to join, the authorities recognised by the United Nations shall, as far as possible, be kept in touch with the work and consulted whenever necessary. Unified standards arrived at through discussions within the committee will be promulgated by the individual national standards bodies. The Committee's Constitution is to run for two years, but before the close of that period the United Nations standard bodies will review the whole question of the international co-ordination of industrial standards. The London office at 19 Palace Street, London, S.W.1, which has just been opened, has been placed under the direction of Mr. C. le Maistre, C.B.E., until recently chairman of the executive committee of the British Standards Institution.

British-made Electrolysers

IN an article published in our issue of August 12, on "Electrochemistry in Spain," the last paragraph was inclined to give the impression that electrolytic cells of the filter-press type (which the Spanish author appeared to favour) were not manufactured in this country. This is far from being in accordance with the facts, and we hasten to dispel any erroneous impression that may have arisen. British-made Electrolytic cells of the filter-press type, for which there is a great international demand, are in fact supplied in this country by Bamag, Ltd., of London, as is well known to our readers. By a coincidence, Dr. Howat's article on "Electrolytic Hydrogen Production" is now in course of publication in THE CHEMICAL AGE, and in his description of the various types of cell which are available, it is made quite clear that the Bamag filter-press cell is of British manufacture—a fact that should dispel all doubts on the subject.

Our Sunflower Crop

THE standard work on industrial fats and waxes by Hilditch contains this remark about sunflower seed oil: "It is rather curious that the oil is not more extensively produced *and, in fact, from seed grown in Britain, the soil and climate being eminently suitable.*" The italics are ours. Hilditch's view seems to be gaining acceptance for not only has the sunflower been grown on an experimental scale here during the war with encouraging results, but commercial sowings have also been made. An account of field trials was given by Mr. G. E. Blackman in the February issue of the Ministry of Agriculture's journal, in which it was stated that yields obtained in Britain have ranged from 10-20 cwt. of seed an acre, with oil contents of

30-36 per cent. of the seed's dryweight. (The latter figure compares well with that quoted in Hilditch's book, where one learns that the seeds contain about 30 per cent. of expressible oil, leaving an oil cake containing about 8-10 per cent. of oil, which in Scandavian countries is priced between linseed and cottonseed cake by virtue of its value as cattle food.) *The Times*, of August 19, is worth consulting for the details it gives about large-scale cultivation in Hertfordshire. In the King's Langley locality some 120 acres of the plant are now being farmed. The ripe seeds will be processed locally at a factory belonging to a firm called Sunflower Seeds, Ltd. The enterprise, we read, enjoys the blessing of the Ministry of Agriculture, and the support of the county war agricultural committee. Thus a crop which has flourished in Russia for many years gains a foothold in Britain. Classed as a "semi-drying" oil, sunflower seed oil contains 34.1 per cent. of oleic acid and 58.5 per cent. of linoleic. It is suitable for table use, and in the manufacture of soap and margarine.

Justice to British Chemists

WE, as an industrial chemical journal, are not especially concerned with penicillin—a therapeutic drug—although the processes by which it is manufactured are of the highest interest to the chemical engineer. What we are concerned about, however, is the extraordinary atmosphere of mystery, rather than secrecy, which surrounds the production of penicillin (among many other things) in this country. In America, the War Production Board has stated that 95 per cent. of the total penicillin in the world is made in the United States. The *Manchester Guardian*, on the other hand, last week published a statement that a huge factory for the production of the drug was to be erected within the next year in the north-west of England. The official attitude of the Ministry of Supply to both of these statements is uncompromisingly null; they appear neither to know nor to care whether the facts are truly stated, or the reverse. A similar attitude seems to prevail in the Ministry of Health, and conflicting and ambiguous statements have been published concerning the amount of penicillin that is, or may become available to civilians. We submit that this sort of thing is unfair to the first-class teams of British research workers and technicians who have done so much to make the large-scale therapeutic use of penicillin a possibility. If the dreary old story is to be repeated, in which British inventiveness loses lustre for lack of enterprise (whether official or commercial), who is to say that it will stop at penicillin? There are other new chemicals and other new processes in various stages of development, and there is nothing to say that they will not go the same way. It is quite possible to tell a coherent story of research and development without divulging details of information that must be kept secret for security reasons; and it is high time that officialdom released the story (which is in danger of becoming addled from overmuch brooding) of the large-scale production of penicillin by British technology.

CANADA'S CHEMICAL INSTITUTE

The establishment in Canada of a single national organisation for chemists was recorded in our issue of June 10, the decision to set up the Chemical Institute of Canada being taken at the Canadian Chemical Conference held in Toronto. The following members constitute the interim board of directors of this Institute: *Chairman*, Mr. L. E. Westman; *hon. treasurer*, Dr. P. E. Gagnon; *hon. secretary*, Dr. R. R. McLaughlin; *director of Business*, Dr. H. R. L. Streight; *director of Information*, Dr. R. V. V. Nicholls; *director of Conferences*, Mr. W. E. Pomeroy; *director of Professional Affairs*, Dr. L. Lortie; *director of External Relations*, Mr. L. E. Westman. Recruiting to the Institute is proceeding, and it is expected that meetings of local sections of the Institute will take place this autumn. A news letter or journal for the membership will be started as soon as arrangements can be made. In some localities where more than one group of the three amalgamating societies—the Canadian Institute of Chemistry, the Canadian Chemical Association, and the Society of Chemical Industry—exist steps have already been taken to co-ordinate or merge local activities for the coming year. The Chemical Institute is appointing a full-time secretary-manager. The Institute's address is: Room 605, New Wellington Building, 137 Wellington Street W., Toronto, 1.

Electrolytic Hydrogen Production

II—Cell Types

by D. D. HOWAT, B.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E.

(*Continued from* THE CHEMICAL AGE, *August* 19, 1944, *p.* 178)

I. Unit or Tank Type Cells

CELLS of this first type may be subdivided into open or closed cells, according to whether the electrolyte is exposed to the air or not. The closed tank type is not common because, in spite of compact design, low capital cost, and small bus-bar requirements, it suffers from difficulties in construction—limited electrode area—in making replacements, in sealing, and in insulation. The Levin, Electrolabs and the I.O.C. unit generators are still used in quite large numbers but are not manufactured on any scale[2]. The open tank type presents the simplest construction, with ease of repair, maintenance and replacement. They occupy considerable floor space, however, in relation to hydrogen output, and suffer from high cost in busbars.

The Knowles Cell.—Well known in many countries, the Knowles cell is a good example of a simple, soundly constructed tank cell. The electrodes, diaphragms, and gas-collecting bells built as a unit are supported when in position by lugs resting on the edge of the tank and may be lifted bodily from the tank. As shown in Fig. 3, the collecting bells are simply narrow rectangular steel casings open at the bottom, the top of the electrode projecting into the open base of the bell. The electrodes are held in position by an arrangement of steel tubes welded into the top of the bell. Pure iron conducting leads pass down through the welded tubes, being insulated at the top and from the inside of the tubes by ebonite nuts and sleeves, the weight of the electrode being taken by the ebonite insulators on top of the tubes. Surrounding each negative elec-

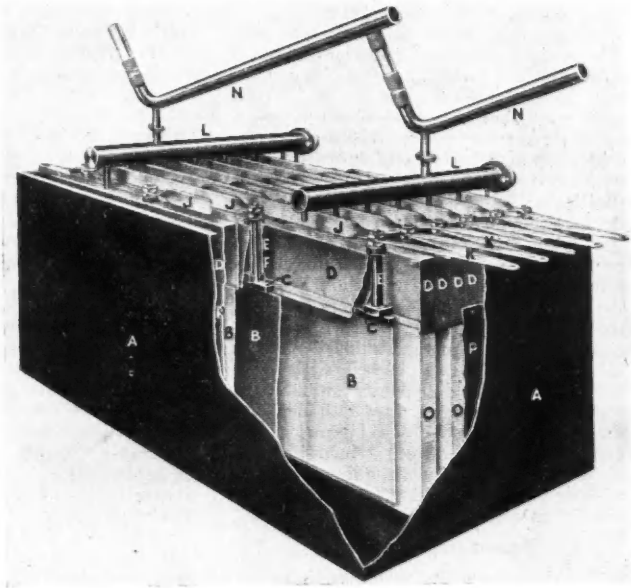


Fig. 3. Sectional view of Knowles cell.

A. Cell Tank; B. Electrodes; C. Electrode Leads; D. Gas-collecting Bells; E. Sealing and Safety Tubes; F. Insulating Tubes; J. Copper Connections; K. Inter-cell Connections; L. Gas Offtake Pipes; N. S-Pipes; O. Asbestos Diaphragms; P. Skirting.

(*International Electrolytic Plant Co., Ltd.*).

trode is a sleeve of asbestos cloth forming the diaphragm, the cloth being sewn to strips of steel wedged in between alternate bells, thus forming gas-tight joints. The diaphragm sleeve hangs freely in the electrolyte, reaching to a point below the bottom of the electrodes, and thereby reducing to a minimum the possibility of mixture of gases and obviating damage to the cloth by shrinkage. In assembly, the requisite number of bells is welded together, a sheet-steel skirting being attached round the outside of the block of bells. The skirting so formed extends below the level of the electrodes and diaphragms, thus completely enclosing the gas-producing area of electrolyte.

Gases are withdrawn through a short vertical pipe opening into each bell. These pipes unite in a common manifold arranged horizontally across the tank top. From the manifold the gases pass into an S-shaped main collecting pipe, so designed to prevent entrained electrolyte from being carried forward to the next cell. The pipe arrangement is duplicated to provide for the independent collection of hydrogen and oxygen, while the connections between adjacent cells are made of glass. Porcelain insulators, between the cell tank and its steel supports and the glass connections in the pipe work, effectively prevent appreciable leakage. In the standard cell design the anodes are coated with electrically deposited spongy nickel to reduce over-voltage; the cathodes are flat iron plates with maximum current capacity of 500 amps. According to Bowen[5] such a cell will require a voltage of 2.12 at 56° C. in an 18 per cent. caustic soda electrolyte.

Recent Improvements

Two improvements in design have recently been effected. Hollow electrodes have been produced by welding and riveting plates to substantial lead-in bars, the plates forming slots at intervals. By this means a circulation of electrolyte is induced and the electrodes may be set more closely, both factors combining to give increased capacity with reduced voltage. Secondly, the electrode capacity has been increased by 100 per cent. by replacing the standard pure iron leads with steel-sheathed copper studs, the voltage increasing simultaneously. In the cell design shown in Fig. 3, the hollow-type electrode with copper lead is employed, the capacity being 2500 amps. at 2 volts or 5000 amps at 2.25 volts.

Ancillary Plant

Plant must be provided to wash the gases free from entrained electrolyte, to supply distilled water for "make-up," and to regulate the temperature of the electrolyte. Temperature regulation may involve either heating or cooling the electrolyte, according to the load on the cell, in order to stabilise it at the optimum value of 65° C. A safety device consisting of a liquid sealed blow-off tube in each cell vents the gases to atmosphere if the level of the electrolyte falls too low. With a guaranteed minimum purity of 99.75 per cent. for hydrogen and 99.5 per cent. for oxygen, the capacity of the cell is given at 16.14 cu. ft. of hydrogen measured saturated with water vapour at 20° C. and 760 mm. pressure and an efficiency of 124 kWh. per 1000 cubic feet.

The Fauser Cell.—In this cell the gas-collecting bell and electrode, assembled as a unit, are separated by high-quality asbestos cement moulding[3]. A salient point of difference, as compared with the Knowles cell, is that the collecting bell is very shallow and is completely submerged in the electrolyte, thus enabling leaks to be detected immediately. The diaphragm takes the form of a piece of asbestos cloth wrapped round the assembly of electrode and bell and separated from the electrode by asbestos cement moulding, the cloth being wired securely round the collecting bell. Rectangular gas ducts project into the top of each bell at about the centre. The ducts serve two purposes: they allow the escape of the gas through slots into the gas collector, and permit the electrode to be fastened securely to the bell by a stud welded or riveted to the electrode and bolted to the top of the gas duct but insulated from it by suitable washers. The gas collectors, rectangular casings stretching across the cell, are open at the bottom and sealed by dipping into the electrolyte. The gases, escaping into the collectors through slots in the ducts, pass thence through glass tube connections to the mains. Lugs welded to each end of the collecting bells rest

on brackets in the end of the main tank, strips of insulating material being inserted between lugs and brackets. The electrodes of hollow design comprise two steel or iron plates held parallel to one another and suitably grooved. Electric power is led to each electrode by a heavily nickel-plated copper strip riveted between the two constituent plates. Suitable insulation is provided around the lead as it passes through the electrolyte. The hollow design of electrode initiates circulation movements in the electrolyte. This movement is particularly desirable as the electrode is deep and, in a still tank, may suffer from gas or vapour screening. As in other commercial cells the anodes are heavily nickel-plated to reduce over-voltage; but in contrast to the Knowles cell each electrode and collecting bell forms a complete sub-assembly which may easily be removed and replaced. In the cell illustrated in Fig. 4, each electrode has a normal rating of 750 amps., the unit having a capacity of 3000 to 4000 amps. with an operating voltage of 2.0 to 2.1 volts in caustic potash electrolyte at normal operating temperature.

Mention may be made of the novel features of two other types of tank cells. The *Stuart Cell*, of Canadian construction, has a cover bolted on and carrying the gas-collecting compartments arranged with alternate collecting bells immersed in the electrolyte.[8] Each electrode is made up of a large number of narrow strips of metal slightly indented at intervals and assembled together vertically but not in contact. The strips are attached at the top to terminal bars from which conductors of ample section pass through the cell cover, the conductors being carefully insulated against gas leakage. The total surface area of the laminated electrode so formed is very large, claims being made that the active surface is about 30 times the apparent area. Spaced very closely together, the electrodes are separated only by the thickness of the asbestos diaphragms.

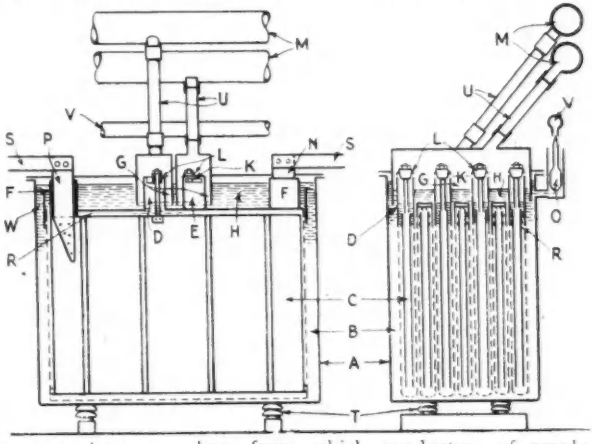


Fig. 4. Fauser cell. (BOWEN).

A. Tank; B. Asbestos Diaphragms; C. Electrodes; D. Gas Ducts (oxygen); E. Gas Ducts (hydrogen); F. Electrode Insulation; G. Gas Collectors; H. Electrolyte; K. Gas Ports; L. Insulated Electrode Supports; M. Gas Mains; N. Negative Electrode Lead; O. Feed-water Float Control; P. Positive Electrode Lead; R. Gas-collecting Bells and Diaphragm Supports; S. Electrical Connecting Links; T. Porcelain Insulators; U. Glass Connecting Tubes; V. Water Feed Main; W. Gas Bell Supports.

The *Burdett Cell*[9] also comprises whole electrode units together with gas-collecting compartments submerged in the electrolyte. Asbestos diaphragms and electrodes are suspended in a casting of multiple compartments partitioning the cell into seven different sections, three for oxygen and four for hydrogen. Gases collect in the upper portions of the casting and pass off through uptake pipes to the manifolds. Normal rating of the cell is 1200 amps. with a voltage of 2.15, hydrogen production being 19 cu. ft. per hour or 7.31 cu. ft. per kWh.

II. The Filter Press Cells

Outstanding in the improvement of filter-press cells in Europe has been the development of the perforated plate electrode. Employment of this hollow electrode gives increased circulation of the electrolyte, increased current density, and reduced tendency to gas and vapour screening of the lower parts of the elec-

trode surface. Other advantages and disadvantages of the filter press cell have already been outlined. This development in filter-press cells is illustrated diagrammatically in Fig. 2.

Fischer[4] points out that to ensure a low voltage drop from one plate to the next, the electrodes must be brought as closely together as possible and the liberated gas bubbles be removed as rapidly as possible from the path of the current. The edges of the perforations in the plates are the zone of most intense electrolytic activity, gas bubbles being formed in greatest numbers around the perforations. Escaping through the perforations, the bubbles pass upward to the collecting bells at the top of the cell, the movement of the bubbles inducing a strong circulation of the electrolyte.

As shown in Fig. 2, the electrodes comprise two parts, the main solid plate, and a forward perforated plate, so forming essentially a hollow electrode. Assembled in a framework, the plates are held together by tie-rods and are suitably insulated along the edges where contact is made. Asbestos diaphragms are employed, constructed of cloth supported on a nickel steel mesh wire. A diaphragm is stretched taut between each pair of perforated plates, the distance between which is reduced practically to the width of the diaphragm.

The *Bamag Cell* shown in Fig. 5, a well-known British filter-press cell, is constructed in the manner just described, but includes at the centre a temperature-control chamber connected with the electrolyte reservoirs.[3] The path of the liberated gases is shown in Fig. 5, the gases together with entrained electrolyte rising through ports, one on either side of the plate, into ducts extending the whole length of the cell. From the ducts the gases pass upward into the main gas washers, while the separated electrolyte flows through the temperature-control chamber, being fed back to the cell units by the return electrolyte channels after passage through the filter. From the return electrolyte channels ports conduct the solution to small holes on each side of the diaphragm.

In operation, a very high current density may be employed with this cell, over 200 amps/sq. ft. being found practicable. According to Fischer[4] the energy consumption is 4 to 4.3 kWh per cu. m. of hydrogen as compared with 4.9 to 5.6 kWh per cu. m. with the unit cell. He also claims that on a basis of floor space occupied the production of hydrogen is 16 cu. m. per sq. m. of area compared with 5 cu. m. per sq. m. with the unit cell.

The *Pechkranz Cell*, of the filter-press type, is made up of circular electrodes,

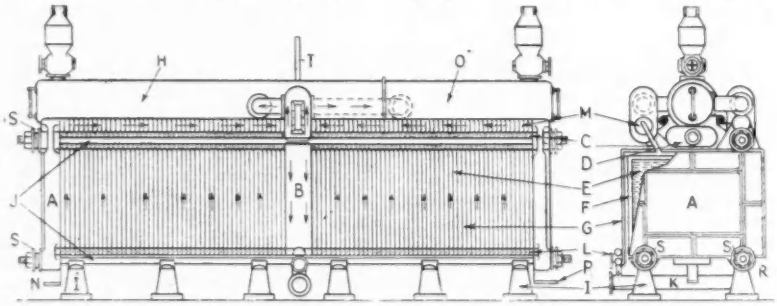


Fig. 5. Bamag electrolyser. (BOWEN).

A. End Frames; B. Temperature Control Chamber; C. Gas and Electrolyte Outlet Pipes; D. Electrolyte Reservoir; E. Electrodes (represented by the vertical lines); F. Diaphragm; G. Cell Frames; H. Hydrogen Washer and Water Drum; I. Insulators; J. Tie Rods; K. Electrolyte Filter; L. Return Electrolyte Channel; M. Gas and Electrolyte Ducts; N. Negative Pole; O. Oxygen Washer and Water Drum; P. Positive Pole; R. Cooling-water Pipes; S. Insulators and Buffer Springs; T. Water Feed Pipe.

The gas bubbles, rushing upward in the space between the perforated plate and the solid back of the electrode, escape into ports communicating with the gas ducts.

6 ft. in diameter. Electrodes and diaphragm frames are bolted up between heavy end-plates connected by tie-rods, a certain number of the electrodes bearing on the tie-rods by insulated rollers.

Gases escape through two ports at the top of the electrodes into the main gas channels extending the length of the cell. From the main channels the gases pass to the welded steel plate reservoirs at the end of the cell. Measuring 6 ft. by 5 ft. by 4 ft. the reservoirs include a separator, gas washer, and electrolyte cooler, from which the solution returns by gravity to the cell. The gases are washed free of the last traces of entrained electrolyte with distilled water, which then is employed as "make-up" in the cell. The quantity of "make-up" water required is claimed to be 7½ gallons per 1000 cu. ft. of hydrogen.

A Unique Feature

The unique feature of this cell is the perforated metal plate diaphragm. Made of pure sheet nickel, the diaphragm is perforated with holes less than 0.004 in. in diameter, the total number of holes per sq. in. being 5000-6000. Strengthened by a number of cross bars of pure nickel attached by nickel rivets, the thin sheet diaphragms are cemented into circular iron frames. To provide insulation and sealing between the electrodes and diaphragms, a mixture is used of plaited asbestos fibres impregnated with an unsaponifiable hydrocarbon.

Ellingham[5] suggests that the ionic conduction through the diaphragm perforations is apparently sufficient to prevent the metallic sheet from acting as a bipolar electrode in respect of gas evolution. According to Elworthy[6], with a 25 per cent. caustic potash solution at a temperature of 75/80° C., the voltage per cell varies from 2 to 2.5. In one installation two units of 140 cells in series are operated from a 700-volt supply and absorb 2500 amps., each unit yielding 2500 cu. ft. of hydrogen per hour at N.T.P. The electrical power requirements were 150/170 kWh per 1000 cu. ft. of hydrogen. Serious operating difficulties were experienced with this cell owing to the fragile nature of the diaphragm, much experimental work being required to develop a diaphragm with a satisfactory life.

Cylindrical Bi-Polar Cell.—Fischer[4] gives a brief note on a circular type of bi-polar cell manufactured by Siemens & Halske, shown in Fig. 6. The unique features in this cell is the use of cylindrical electrodes and diaphragms, all attached to the top lid or cover of the cell. With the method of construction shown the benefits of the bi-polar cell are obtained—large electrode area, circulation of electrolyte and close spacing of the electrodes—without the attendant disadvantages of sealing and insulation. Constructed in two separate parts, the cell comprises a lower cylindrical body and a detachable lid or cover. The body of the cell consists of an annular space, the inner and outer walls of the annulus being coupled to the negative pole of the supply. A single metal cylinder, welded to the cover of the cell, extends down the centre of the annulus, this cylinder being connected through the cover to the positive pole of the supply. The remaining electrodes together with the diaphragms are built up into a framework mechanically attached to, but electrically insulated from, the cover. The gas-collecting bells open into one or other of two uptakes in the cover of the cell, the hydrogen and oxygen being taken off through two separate outlets. As will be evident from the description and the diagram, all insulators and seals are located above the level of the solution, so contributing in a marked degree to the life of these materials. No figures are given of the size or electrical capacities of the units, but the design is novel and appears to offer considerable promise.

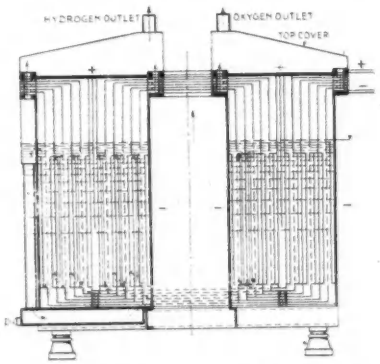


Fig. 6. Arrangement of electrodes, diaphragms, and gas-collecting bells in circular-section type of bi-polar cell designed by Siemens and Halske (FISCHER).

The Oerlikon Cell has been developed

from one of the earliest designs of filter-press cell[3]. As shown in Fig. 7, the electrodes are of the same design as those described earlier, being essentially hollow electrodes with a forward perforated plate. In one particular feature the design of the cell is rather unusual, as it incorporates a pump for forced circulation of the electrolyte. This assists materially in providing uniform concentration of the electrolyte and enables very high current densities to be maintained, values in excess of 200 amps./sq. ft. being quite normal. Operating at a temperature of about 80° C., the voltage of the cell will be about 2.15 with an electrical efficiency of 115 kWh per 1000 cu. ft. of hydrogen saturated with water vapour at 20° C.

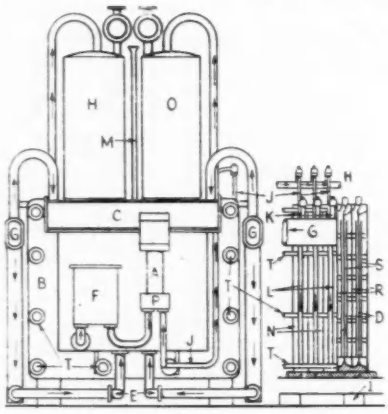


Fig. 7. Oerlikon cell (BOWEN).

A. Electrolyte Reservoir; B. End Plate; C. Gas Coolers; D. Asbestos Diaphragms; E. Electrolyte Pipes; F. Electrolyte Filter; G. Gas Separating Ducts; H. Hydrogen Gas Washer; I. Insulators; J. Return Electrolyte Feed Pipes; K. Gas and Electrolyte Outlets; L. Cell Feed Pipes; M. Water Feed Pipe; N. Cell Frames; O. Oxygen Gas Washer; P. Circulating Pump; R. Electrodes; S. Forward Electrodes; T. Tie Rods.

(To be concluded)

RESEARCH IN MANCHESTER

The first members of the Manchester Joint Research Council which is being formed jointly by the Manchester Chamber of Commerce and the Manchester University were announced last week by the Vice-Chancellor of the University (Sir John Stopford) and the president of the Chamber (Mr. A. H. S. Hinchliffe) as follows:

University representatives: Professor P. M. S. Blackett, Dr. C. J. T. Cronshaw, Professors D. R. Hartree, J. R. Hicks, Willis Jackson, J. Jewkes, and F. C. Thompson, Sir William Clare Lees, Dr. J. E. Myers, Professor M. Polanyi, Sir Ernest Simon, Sir John Stopford, Sir Raymond Streat.

Chamber representatives: Messrs. J. Harold Brown, E. A. Carpenter, J. Curwen, R. H. Dobson, John S. Dodd, M.P.; Dr. A. P. M. Fleming, Messrs. H. M. Harwood, A. H. S. Hinchliffe, Frank Longworth, L. E. Mather, N. G. McCulloch, Lord Peel, Messrs. C. G. Renold, A. V. Sugden, and John F. West.

After the first meeting which, as already announced, is to be held on October 9, it is proposed that the Joint Council shall meet quarterly. At the first meeting various constitutional matters will be settled. The first chairman will be elected and other members co-opted. In this latter connection, proposals will be tabled to ensure close liaison with the British Cotton Industry Research Association and the Department of Scientific and Industrial Research. Other subjects noted for consideration are a statement of the aims and objects of the Joint Council; election of an executive committee; secretariat; and the proposed establishment of an information bureau.

CHEMICAL RETTING OF JUTE

The possibility of using chemical compounds to promote the retting of jute has been investigated by H. Chatterjee, C. R. Nodder and P. B. Sarkar, of the Technological Research Laboratories of the Indian Central Jute Committee, who record the results of their experiments in *Science and Culture*, 1944, *9*, 10, p. 451. Their investigations were based on the assumption that retting involves the decomposition of the pectin that holds the fibre bundles of jute together and that in chemical retting the pectin would be removed in the form of soluble salts, preferably by double decomposition. It was thought that water-soluble salts of sodium, potassium or ammonium with any acid (organic or inorganic) whose calcium and magnesium salts are both insoluble or practically so, would be good retting agents. A fairly large number of salts have been tried for retting jute plants or bark (green or dried) and in every case the above hypothesis has been found to hold good. Thus sodium sulphite is a good retting agent (both Ca and Mg sulphites are insoluble in water) but sodium sulphate is useless (calcium sulphate is sparingly soluble but $MgSO_4$ is highly soluble in water). Ordinarily, a 1 per cent. solution of the salt at 70°-80° C. for 1-4 hours is sufficient for satisfactory retting.

Fluorine in Organic Synthesis

Commercial Derivatives and Catalytic Use*

COMMERCIAL development of the Freon refrigerants in 1930 and the more recent development of the "alkylate" for 100-octane aviation fuel strikingly illustrate the impact of a new tool, fluorine chemistry, upon the synthetic organic industry. These developments represent two entirely different rôles played by fluorine compounds, and are harbingers of what can be expected in the future. In the first instance, the Freons are organic fluorine compounds, and in the latter, the aviation alkylate does not contain fluorine in its molecules but depends upon hydrogen fluoride as a catalyst in its synthesis.

The Swarts Reaction

The initial industrial achievement in organic fluorine chemistry came when Midgley and Henne in 1930 announced the commercial production of new refrigerants, Freons. (Freon is a trade name of Kinetic Chemicals Co. for the new refrigerants.) They put into industrial practice a chemical reaction discovered in 1892 by Swarts, a Belgian chemist. The Swarts reaction, in its simplest terms, involves the replacement of chlorine by fluorine in a suitable organic compound by means of anhydrous antimony trifluoride; in some cases, antimony pentachloride is necessary.

Freons are chlorofluoro derivatives of methane and ethane, and are prepared from carbon tetrachloride, chloroform, and hexachloroethane according to the compound desired. For illustrative purposes, the commercial synthesis of dichlorodifluoromethane (F.12) is described. Carbon tetrachloride and anhydrous hydrofluoric acid are fed continuously into a heated reactor containing the anhydrous antimony halide. The reaction products pass into a fractionating column where the free acids (HCl and HF) are separated from the Freon and the insufficiently fluorinated raw material is returned to the system. This fractionation is simple as, for example, in the case of carbon tetrachloride, where each substitution of a fluorine for a chlorine atom is accompanied by a lowering of the boiling point of about 52°C. By means of scrubbing and drying towers the final product is condensed, and sold in cylinders or in carload lots. The active fluorinating agent or catalyst, antimony trifluoride, is continuously regenerated.

The most recent and distinguished work in organic synthesis involving fluorine chemistry is the preparation of "alkylate" for 100-octane aviation spirit by hydrogen fluoride alkylation. The discovery of this process by Ipatieff and his co-workers in the Universal Oil Products laboratories, and the initial plant installation by the Phillips Petroleum Co. in 1942 is of inestimable value to the war effort in respect to air supremacy. Due to war restrictions, details on this process are not available, but the essential principles are known.

Hydrogen Fluoride and Petroleum

The process is essentially the conversion of olefines in the presence of isoparaffins to saturated products with anhydrous hydrofluoric acid as a catalyst. Usual engineering materials are employed, for corrosion is not a serious factor so long as moisture is excluded. A thoroughly mixed feed stock of olefines and isoparaffins is fed into an alkylation chamber containing anhydrous hydrofluoric acid. Since HF is quite insoluble in the hydrocarbon mixture and since considerable heat of reaction is evolved in the alkylation, the chamber is equipped with suitable stirring equipment and cooling coils. The reaction products are passed into a separating tank to allow the HF to separate as a lower layer and be returned to the alkylation chamber. From the separating tank, the hydrocarbon mixture is passed successively into a HF stripping column, a dehydrofluorinator, a de-isobutaniser, a debutaniser, and finally through a fractionating column to give the desired alkylate fraction. Since the alkylation is a liquid phase reaction, it is necessary to maintain sufficient pressure so that the reacting components remain in a liquid state.

The alkylate is a mixture of branched methyl side-chain isomers of heptane, octane, etc. The 100-octane aviation spirit may contain from 25 to 40 per cent. of this alkylate. Triptane—2, 2, 3-trimethylpentane—recently announced as the most powerful aviation fuel component known, can also be made by this process, but in very low yields.

Shortly after the appearance of the Freon refrigerants, I.G. in Germany introduced a new series of fast Naphthol AS type dyes which contained fluorine in their molecules. Some of these dyes appeared on the American market. The print dyes exhibit unusual clearness in colour (mostly yellow, orange and red) and possess excellent light fastness. In general, they are coupled products of a Naphthol AS type with fluorine containing diazotised bases. Fast Orange Salt RD is probably a representative of one of the diazotised bases. The diazotised bases are supposedly derivatives of benzotrifluoride

*Condensed from an article by G. C. Finger in *Chemical & Metallurgical Engineering*, June 1944, p. 101.

(a fluorine analogue of benzotrichloride). In benzotrifluoride ($C_6H_5CF_3$) the fluorine is present in the form of a $-CF_3$ group. This group in contrast to its chlorine analogue, $-CCl_3$, is very stable, does not hydrolyse under ordinary conditions, and many of the usual reactions used in the synthesis of dye intermediates have no deleterious effect upon it. Benzotrifluoride can be prepared from benzotrichloride by the Swarts reaction in the absence of a catalyst. Commercially, anhydrous hydrofluoric acid is used in place of antimony trifluoride. The reaction takes place in an autoclave under heat and pressure resulting in an almost quantitative yield. The process is similar to the production of Freons.

Fluorinated Ethylenes

Swarts in his studies on fluoroethylenes reported that a number of these compounds gave polymers of varying degrees of hardness. A striking example cited by him in 1909 was that α-bromovinylfluoride ($CH_2 = CBrF$) gave a "translucent block as hard as glass." Nothing further was done on this subject until a patent was issued to I.G. in 1939 on some vinyl polymers that are described as uninflammable, insoluble in organic solvents, and very stable to chemical agents. In this group, trifluorovinylchloride exhibited these properties to the greatest extent. Theoretically, tetrafluoroethylene should give the most stable polymer, and in 1941 a patent was issued to the du Pont company on this polymer. In the latter patent, it was indicated that this polymer was fairly clear and transparent, and could be moulded, and there is no question that such a product will find some interesting applications.

The fundamental compounds for the synthesis of these polymers are directly related to the ethane type of Freons discussed earlier in this article. In general, the fluorinated olefines may be synthesised from an appropriate chlorofluoroethane by the removal of HCl or two adjacent chlorine atoms by well-known reactions. Halogen acid may be removed by various alkaline reagents. The preferred reaction is the removal of two chlorine atoms on adjacent carbon atoms by zinc in a suitable solvent such as alcohol. Heat and pressure are sometimes necessary to obtain satisfactory yields. Since the higher fluorinated ethylenes are gases, they are synthesised and polymerised in closed systems.

In the case of non-fluorine polymers, boron trifluoride has been used as a catalyst in the synthesis of a rubber-like polymer from isobutylene. It is doubtful whether BF_3 is being used in the present synthetic rubber programme. The ability of HF as a catalyst in polymerising olefines is rather common knowledge; also, certain vegetable oils are readily polymerised to a rubber-like material.

Synthesis of Acetic Acid

One of the most important applications of boron trifluoride as a catalyst is in the new synthetic acetic and propionic acid process of the du Pont Company. The catalyst is actually used in the form of a hydrate. The process is essentially a condensation of carbon monoxide with methanol or ethanol under pressures as high as 900 atmospheres at 260°C. Yields of 79 per cent. for acetic and 50 per cent. for propionic acid are reported.

It is possible to effect many other condensations with this catalyst, particularly where an acid type of catalyst is required for the operation.

The question of the use of fluorine compounds as insulating and cooling oils for transformers and the like has been superficially investigated. Chlorinated paraffins and biphenyls are being used for this purpose and it is only natural to suspect that the fluorine compounds may be more stable. A number of patents have been issued covering the use of some of the chlorofluoroethanes (Freon derivatives) and chlorinated benzotrifluorides for this purpose, but the possibilities have not been exhausted.

Some interest has been indicated in medical and pharmaceutical fields. In Germany, 3-fluorotyrosine was sold under the name of Pardinon for treatment of hyperthreosis; and an ointment Epidermin containing *p-p'*-difluorobiphenyl for the treatment of wounds and burns was also available. It has been indicated that *p*-fluorosodium benzoate can be used as an internal antiseptic as it is not as toxic as sodium fluoride.

Pest Control Chemicals

Fluoroacetic, fluorobenzoic and fluorobenzene sulphonic acids have been suggested for use as fungicides, insecticides and disinfectants, but in most cases there is a question of their efficacy. Fluorostearic acid is reported to be as effective as certain copper preparations for mildew control. This compound is readily prepared by the addition of HF to oleic acid; the addition of HF to the double bond is rapid in contrast to HCl which combines very slowly. Outside these few instances, the field of fungicides, insecticides, etc., is practically unexplored and should hold considerable promise for future investigations and developments.

The Ministry of Food announces that there will be no change in the existing prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period ending October 14.

Chemicals in South Africa

A Field for Sulphur Recovery

From our Cape Town Correspondent

THE possibility of recovering the enormous wastage of sulphur discharged into the atmosphere from the copper smelters in Northern Rhodesia was dealt with by the copper-belt representative of African Explosives and Industries, which is connected with Imperial Chemical Industries Ltd., in a recent address to the inaugural meeting of the Mine Officials and Salaried Association at Luanshya. He pointed out that there were several well-established methods for the recovery of sulphur waste gases. In Sweden, for instance, about 25,000 tons of high-grade sulphur were recovered annually, and a ready market for recovered sulphur existed in the Union; African Explosives and Industries' factories alone consumed about 74,000 tons of sulphur each year. Many hundreds of tons of sulphur were also used by the South African farmers for dusting grape vines, and the starvation of the soil owing to war restrictions would undoubtedly call for an increased consumption of superphosphate.

The Broken Hill mine, it was said, required several hundred tons of sulphur for sulphuric acid manufacture each month. It was said that the Union would be in a fair position to manufacture synthetic resins of the casein type if sufficient supplies of methyl alcohol were made available by the distillation of wood from the immense forests of Northern Rhodesia. Other industries which might be considered were the production of carbon bisulphide and xanthates for the copper mines.

Pectin from Citrus Fruit

It is probable that in the near future much of South Africa's annual waste of citrus fruit and orange peel will be utilised in the manufacture of pectin, of which there is a universal shortage to-day. Some months ago South Africa sent several tons of dehydrated citrus to Great Britain, partly for the manufacture of marmalade and partly for the extraction of pectin. While awaiting reports from Great Britain, which have not yet come to hand, the South African Division of Dehydration and Cold Storage itself concentrated on the production of pectin. Recently, this new and growing division of the Department of Agriculture and Forestry produced a citrus powder which proved to be nearly 100 per cent. more potent in its pectin content than the samples sent to Great Britain. It is understood that the Government has become so interested in these results that steps are now being taken to induce private enterprise to undertake the manufacture of pectin in South Africa, or at any rate to produce a dehydrated citrus substance from which pectin can easily be extracted. The necessary plant is said to be available in the country. Twenty-eight rooms are being fitted out as laboratories and office accommodation provided for a staff of 32 at the old Provincial Council building in Queen Victoria Street, Cape Town, which becomes the new headquarters for the Division of Dehydration and Cold Storage. Dr. G. M. Dreosti, officer-in-charge, and some of his staff are already in occupation, although the extensive alterations are not expected to be completed until the middle of August. Several miniature electric dehydrators will be installed on the top floor. The basement will accommodate a full-size dehydration plane. The spacious hall, formerly the Provincial Council chamber, may become a library and lecture room.

Salt Imports

A complaint made in a letter to the Press that the South African control gave permits to the United States for the export of salt to South Africa and cut out Great Britain was referred to the office of the Director-General of Supplies for comment. It was officially stated that the British Government gave South Africa a small quota of table and dairy salt, and import documents were issued to cover this amount. The United States also allocated an additional quantity of the same types of salt to the Union, and documents were issued in connection with it. The British Government has since asked the Union not to place any further orders in Great Britain as they would be embarrassing in view of Britain's own needs. The Union Government was asked to find an alternative source of supply, and a conference is at present being held in Kimberley to further the steps that have been taken so far in this matter.

Wattle Wood Charcoal

The Fuel Research Institute reports that a highly active charcoal prepared from wattle wood has been found suitable for use in its oil regeneration process and generally as a decolouring agent. Drawings of a portion of the pilot plant used in the preparation of this carbon have been prepared and with them a layout plan of the plant and a description of the manufacturing processes. It is urgently necessary for South Africa to do everything possible to conserve its stocks of lubricating oil and to reduce in every way

possible its importation of new stocks. Two years ago plant for regenerating used lubricating oil was designed by the Institute. It was fairly simple and could deal with about 80 gallons of oil a day, but the difficulty was that bentonite had to be used to remove impurities and decolourise the oil. It was almost impossible to import this material and as no satisfactory local substitute could be found little use was made of the plant, which can now be used with the active carbon discovered by the institute. The charcoal is a suitable filtration medium. It is possible to regenerate used lubricating oil several times, and each time only a small percentage of the oil is lost. So far only the Government departments seem to have used the plant, but efforts are being made also to get it adopted by private users.

New Manufactures

Chrome Chemicals, 28 Madison Street, Jeppe, Johannesburg, are manufacturing car polish, distemper, motor car lacquers, furniture and leather lacquers, under-coatings, casein leather finishes, automotive chemicals, rubbing compounds, putty, and primer surfacer under a brand name. The Transvaal Carbonic Acid Gas Co. recently celebrated its 50th anniversary, having been founded in Johannesburg in 1894. Carbon dioxide, the main product of the firm, is sold extensively to breweries and mineral water firms. Their by-product, magnesite, is utilised in the production of fire bricks, floor tiles and is allied with cement for filters. This magnesite is also used in various medicinal preparations.

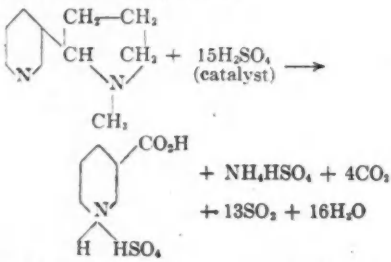
Preparing Nicotinic Acid

New American Techniques

NEW processes for the preparation of nicotinic acid are described in two articles by C. F. Woodward, C. O. Badgett and J. G. Kaufman in *Ind. Eng. Chem.*, 1944, *36*, 6, p. 540 and p. 544. Investigations into the chemistry of nicotinic acid production were undertaken following the recommendation of the American National Research Council that wheat flour should be fortified by the addition of certain vitamins, included among which was nicotinic acid. The estimated requirements for this purpose amounted to 200,000 lb. of nicotinic acid a year, whereas the country's total annual output of this substance was in the region of only 10,000 lb. This unprecedented demand naturally stimulated research on a variety of starting materials from which this vitamin can be prepared, such as nicotine, β-picoline, quinoline and pyridine.

Working at the Eastern Regional Research Laboratory of the U.S. Department of Agriculture, Woodward, Badgett and Willaman developed one process whereby nicotine is converted into nicotinonitrile by catalytic vapour-phase oxidation. The highest yield of nicotinonitrile (51.5 per cent. of theoretical) was obtained with a porous vanadium pentoxide catalyst, prepared by the addition of an excess of acetic acid to a hot aqueous solution of ammonium vanadate. Porous plate, acid-washed kaolin, activated alumina, pumice, aluminium and iron were used with some success as carriers for this catalyst.

Catalytic liquid-phase oxidation of nicotine, β-picoline, and quinoline to nicotinic acid has been studied by the same research workers. The general procedure for the oxidation of nicotine involved heating a stirred mixture of nicotine, sulphuric acid and catalyst. The weight of sulphuric acid added to the reaction mixture was slightly in excess of the amount required according to the following equation.



Although some oxidation of nicotine occurred at 200°C., the reaction was usually carried out at 250-330°C. In the absence of a catalyst the yield was only 18.9-22.4 per cent. of theoretical; improved yields were obtained when catalysts were present, the highest yield—76.6 per cent. of the theoretical amount—being obtained using a selenium catalyst. The maximum nicotinic acid yield from β-picoline approximated 50 per cent. of the theoretical, and that from quinoline was about 75 per cent. The yields were not markedly altered by variation in sulphuric acid strength or by conducting the reaction under reduced pressure. This method of oxidation represents an improvement in some respects over previously known procedures, although the high reaction temperature is a disadvantage.

A critical shortage of quinidine is likely to occur in Canada, according to a statement from the Department of Munitions and Supply. The Canadian Medical Association has warned its members in a notice which points out that "Quinidine is approaching short supply, not only in Canada but also in the United Kingdom and the United States." Conservation measures have been recommended to the medical profession.

Personal Notes

MR. THEODORE INSTONE, one of the founders of British Benzol and Coal Distillation, Ltd., has resigned his directorship in that company.

The engagement is announced between SURGEON-LIEUT. W. J. NAUNTON, R.N.V.R., son of Dr. W. J. S. Naunton, F.R.I.C., and Miss H. M. Crosland, W.R.N.S., of Bury, Lancashire.

Columbia University has conferred an honorary D.Sc. upon DR. TE-PANG HOU, the Chinese chemical engineer, who is considered one of the world's leading authorities on soda manufacture.

Obituary

The death on August 15 is announced of LIEUT.-COLONEL LEO FRANK GOODWIN, professor of chemical engineering at Queen's University, Kingston, Canada.

MR. ROBERT FULTON, for several years hon. secretary of the Manchester section of the Oil and Colour Chemists' Association, has died, aged 39, in a military hospital. Before joining the R.A.F. in 1941, he was on the staff of the Geigy Colour Co., Ltd., Manchester.

New Control Orders

Glycerine Supplies

SUPPLIES of glycerine are now available for the production of anti-freeze mixtures, and an Order has accordingly been made by the Minister of Supply releasing any material containing not less than 90 per cent. by weight of glycerol from the restrictions on production, disposal and acquisition of anti-freeze materials imposed by the Control of Engine, etc., Anti-Freeze (No.1) Order, 1942. Formerly certain vehicle operators who held permits issued by the Ministry of War Transport were allowed to purchase supplies of ethylene glycol anti-freeze. As the manufacture of anti-freeze from glycerine is no longer prohibited this system will now cease. Copies of the Order (The Control of Engine, etc., Anti-Freeze (No.2) Order, 1944) can be obtained from H.M. Stationery Office, or through any bookseller, (S.R. & O. 1944, No. 930), on or after August 17.

Iron and Steel

The Minister of Supply has made the Control of the Iron and Steel (No. 35) Order, 1944 (S. R. & O. 909), which came into force on August 15. The principal alterations are as follows:

(1) The distribution scheme has been amended so far as springs and used wire netting are concerned; (2) the maximum prices for iron castings and for manufactured iron (wrought iron) are increased; (3) maximum prices are introduced for certain types of cold drawn ubes, and (4) the control of merchants' (including stockholding merchants') selling prices is extended to include a number of products not hitherto price-controlled for sales by merchants, and by fixing margins which may be added by merchants other than stockholding merchants. A number of related price schedules are revoked, and replaced by new schedules. Copies of the order may be obtained from the Stationery Office, price 1d.

Nuts and Bolts

The control of nuts, bolts, etc., is varied by the Control of Bolts, Nuts, Screw Studs, Washers and Rivets (No. 5) Order, 1944 (S. R. & O., No. 910), which the Minister of Supply put into force on August 15. This amends similar control orders—Nos. 1, 3 and 4—of last year.

Reducing Nitrobenzene

Use for Sulphite Waste Liquor

CONDITIONS necessary for the reduction of nitrobenzene by sulphite waste liquor and alkali have been studied by I. A. Pearl and H. F. Lewis, of the American Institute of Paper Chemistry, who record their results in *Ind. Eng. Chem.*, July, 1944, p. 664. The reaction mechanism has been investigated, and sodium *p*-azobenzenesulphonate was identified as an important product of the reaction when carried out at atmospheric pressure. Other reduction products obtained in high yield, depending upon conditions, were azoxybenzene, azobenzene, and aniline. Sulphite waste liquor is indicated as a good substitute for zinc dust in the preparation of a mixture of azoxybenzene and sodium *p*-azobenzenesulphonate for direct conversion to benzidine. Vanillin is a by-product of the simultaneous oxidation of the lignin in the sulphite waste liquor, and recoveries up to 25 per cent., based on lignin, are obtained.

Desulphonated lignin was also tested as a reducing agent. At atmospheric pressure it proved a poor agent for reducing nitrobenzene in the presence of alkali. At pressures higher than atmospheric the desulphonated products give almost the same reduction results as the original lignin material. However, simultaneous vanillin yields resulting from the oxidation of the desulphonated lignin are substantially less.

Highest yields for the various by-products (these maxima were, of course, achieved in different experiments) were as follows: aniline, 67.5 per cent.; azobenzene, 65 per cent.; azoxybenzene, 67.5 per cent.; sodium *p*-azobenzenesulphonate, 24.1 per cent., crude vanillin (80 per cent. pure), 29.2 per cent.

Prices of British Chemical Products

A FAIR volume of inquiry has been circulating in the London chemical market during the past week, and the movement into consumption so far as the principal industrial outlets are concerned has been on steady lines. There has been no apparent easiness in the price position, and in most instances the undertone is very firm. Among the soda products, there have been fairly steady deliveries of industrial refined nitrate of soda, quotations for which are well maintained. Percarbonate of soda is well held, and has been the subject of fresh inquiry. A moderate volume of new business has been reported in both nitrite and acetate of soda at unchanged rates, while salt cake is moving steadily into consumption. Glauber salt is a steady market. The hyposulphites of soda remain steady with a good inquiry for both the commercial and photographic qualities. Bichromate and prussiate of soda continue in short supply, and are finding a ready outlet. Among the potash compounds permanganate is a strong market, and a persistent call for supplies is reported. Yellow prussiate of potash is scarce with values firm, while acid phosphate of potash is in good demand and quotations are firm. In other directions white powdered arsenic is active, and a steady inquiry is reported for formaldehyde and peroxide of hydrogen. Quotations are well held for alum lump, and a fairly steady trade is reported. There is an active market for both the crude and refined grades of glycerine with prices unchanged at the controlled levels. Both inquiry and fresh business on the coal-tar products market here during the past week has been moderate, and a steady call for contract supplies is reported. Pitch prices are well held and a fair home trade is reported with supplies plentiful. Crude tar is moving steadily into consumption. Cresylic acid is an active market, and contract movements of crude carbolic acid and phenol crystals are on a good scale. Most of the light distillates are meeting with a steady demand.

MANCHESTER.—Trading conditions on the Manchester chemical market during the past week have been no more than moderately active, both from the point of view of new business and deliveries under contract. This applies as much to textile, bleaching and dyeing materials as to other descriptions. To a large extent holiday conditions at industrial centres in Lancashire and the West Riding of Yorkshire continue to be responsible for the relative calmness. So far as prices are concerned the market is firm in pretty well all directions. New business in the tar products has not been of much consequence, though the leading light and heavy materials are leaving the works in good quantities against contracts.

GLASGOW.—In the Scottish heavy chemical trade there has been no change during the past week. Home business remains steady while export inquiries are still rather limited. Prices remain firm with no actual changes.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £39 10s.; 10 cwt./ 1 ton, £40 10s., 4/10 cwt., £41 10s.; 80% pure, 1 ton, £41 10s.; 10 cwt./1 ton, £42 10s.; 4/10 cwt., £43 10s.; commercial glacial, 1 ton, £49; 10 cwt./1 ton, £50; 4/10 cwt., £51; delivered buyers' premises in returnable barrels, £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r.

Aluminium Sulphate.—Ex works, £11 5s. per ton d/d.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Carbonate.—£37 10s. to £38 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Antimony Oxide.—£111 to £117 per ton.

Arsenic.—99/100%, under 1 ton, £62; 1 ton, £61; white 98/99%, £59; grey 96/97%, £54; grey 95/96%, £52; crude, £35 per ton.

Barium Carbonate.—Precip., 4-ton lots, £18 per ton d/d; 2-ton lots, £18 5s. per ton.

Barium Chloride.—98/100%, prime white crystals, £17 10s. to £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £18 15s. per ton d/d; 2-ton lots, £19 10s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £34; crystals, £35; powdered, £35 10s.; extra fine powder, £36 10s. B.P., crystals, £43; powdered, £43 10s.; extra fine, £44 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £84 10s.; powdered, £85 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £62; crystals, £63; powdered, £64; extra fine powder, £66. B.P., crystals, £71; powder, £72; extra fine, £74.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£15 to £16 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5½d. per lb.

Chromic Acid.—1s. 5d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Oxide.—Black, powdered, about £100 per ton.

Copper Sulphate.—£31 5s. per ton, f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., for 10 cwt., or more, £14 11s. 6d.; 5 to 10 cwt., £14 12s. 6d.; 2 to 5 cwt., £14 13s. 6d.; 1 to 2 cwt., £14 14s. 6d., d/d in sellers' returnable casks. Less than 1 cwt., 2s. 8d. to 2s. 10d. per lb. d/d. Maximum controlled prices.

Formaldehyde.—£25 to £27 15s. per ton in casks, according to quantity, d/d.

Formic Acid.—85%, £47 per ton for ton lots, carriage paid; smaller parcels quoted up to 50s. per cwt., ex store.

Glycerine.—Chemically pure, double distilled 1260 s.g., in tins, £4 to £5 per cwt., according to quantity; in drums, £3 19s. 6d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 11d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £57 per ton: dark tech., £50 per ton ex works: barrels returnable.

Lead Acetate.—White, 50s. 6d. to 52s. 6d. per cwt. MANCHESTER: £51 to £54 per ton.

Lead Nitrate.—About £47 per ton d/d in casks.

Lead, Red.—English, 5/10 cwt., £45 per ton; 10 cwt. to 1 ton, £44 15s.; 1/2 tons, £44 10s.; 2/5 tons, £44; 5/20 tons, £43 10s.; 20/100 tons, £43; over 100 tons, £42 10s. per ton, less 2½%, carriage paid. Non-setting red lead, 10s. per ton dearer in each case.

Lead, White.—Dry English, less than 5 tons, £57; 5/15 tons, £53; 15/25 tons, £52 10s.; 25/50 tons, £52; 50/200 tons, £51 10s. per ton, less 5% carriage paid. Ground in oil, English, 5/9 cwt., £69; 10 cwt., £68 10s.; 1/2 tons, £67 10s.; 2/5 tons, £66; 5/10 tons, £64; 10/15 tons, £63; 15/25 tons, £62 10s.; 50/100 tons, £61 10s. per ton, less 5% carriage paid.

Litharge.—1 to 2 tons, £44 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 15s. to £22 15s. per ton.

Magnesium Chloride—Solid (ex wharf), £22 per ton.

Magnesium Sulphate.—Nominal.

Mercury Products.—Controlled price for 1-cwt. quantities: Bichloride powder, 15s. 8d.; bichloride lump, 16s. 3d.; mercury oxide, red cryst., 20s. 9d.; red levig., 20s. 3d.; red tech., 19s. 11d.; yellow levig., 20s. 2d.; yellow tech., 19s. 7d.; sulphide, red, 17s. 9d.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 2s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 2s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£60 to £65 per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

Paraffin Wax.—Nominal.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £73 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 7¾d. per lb.; ground, 8¾d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £67 5s. per ton ex store; hydrated, £61 10s. per ton.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 10d. per lb. for 1 cwt. lots; for 3 cwt. and upwards, 1s. 9½d. per lb.; technical, £7 18s. 6d. to £8 10s. 6d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.

Soda, Caustic. — Solid 76/77%; spot, £16 7s. 6d. per ton d/d station.

Sodium Acetate.—£41 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 6½d. per lb.; anhydrous, 6¼d. per lb., net, d/d U.K.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£21 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£36 to £42 per ton, nominal.

Sodium Hyposulphite.—Pea crystals, £21 10s. per ton for 2-ton lots; commercial, £15 per ton.

Sodium Iodide.—B.P., for not less than 28 lb., 9s. 11d. per lb., for not less than 7 lb., 13s. 1d. per lb.

Sodium Metasilicate.—£16 10s. per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£20 to £23 10s. per ton for ton lots.

Sodium Percarbonate.—21½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £26 10s. per ton d/d for ton lots. Tri-sodium, £27 10s. per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£4 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £18 5s. per ton, d/d, in drums; crystals, 30/32%, £12 7s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton, ground, £15-£16.

Sulphuric Acid.—168° Tw., £6 10s. to £7 10s. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 3s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £19 12s.; 5 to 10 cwt., £19 13s. 6d.; 2 to 5 cwt., £19 15s.; 1 to 2 cwt., £19 17s. Less than 1 cwt., 3s. 7d. to 3s. 9d. per lb. d/d, according to quantity. Maximum controlled prices.

Tin Oxide.—Nominal.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £34; green seal, £33; red seal, £31 10s.

Zinc Sulphate.—Tech., £20-£21 per ton, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 1s. 2d. to 2s. 1½d. per lb. Crimson, 2s. 2d. to 2s. 6d. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£34 to £39 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£44 to £49 per ton, according to quantity.

Chromium Oxide.—Green, 2s ped lb.

India-rubber Substitutes.—White, 6 3/16d. to 10½d. per lb.; dark, 6 3/16d. to 6 15/16d. per lb.

Lithopone.—30%, £25 per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton d/d farmer's nearest station, in September, £20. Increased charge of 2s. 6d. per month up to March, 1945.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in September, £9 11s. 6d. Increased charge of 1s. 6d. per month up to March, 1945.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, in September: I.C.I. type "Special No. 1." £14 16s. 6d. Increased charge of 2s. 6d. a month up to March, 1945.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £15 5s. per ton; granulated, over 98%, £14 10s. per ton.

Coal Tar Products

Benzol.—Crude, 60's, 1s. 11d.; pure, 2s. 6d., per gal., ex works.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. to 4s. 6d., according to specification. MANCHESTER: Crystals, 9¾d. to 11½d. per lb., d/d; crude, 4s. to 4s. 6d., naked, at works.

Creosote.—Home trade, 6½d. to 7d. per gal., f.o.r. maker's works. MANCHESTER, 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 6d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 8d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 2d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £6 6s. 8d. to £9 7s. 7d. per ton, according to m.p.; hot-pressed, £11 5s. per ton, in bulk ex works; purified crystals, £19 to £35 per ton. Controlled prices.

Pitch.—Medium, soft, 50s. to 55s. per ton, f.o.b. MANCHESTER: 60s. to 62s. per ton f.o.b.

Pyridine.—90/140°, 17s. to 17s. 6d. per gal.; 90/160°, 13s.—MANCHESTER, 13s. 6d. to 18s. per gal.

Toluol.—Pure, 2s. 7d. per gal.; 90's, 1s. 11d. per gal. MANCHESTER: Pure, 2s. 7¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 1½d. to 3s. 4d. per gal., according to grade, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Wood Distillation Products

Calcium Acetate.—Brown, £21 per ton; grey, £24. MANCHESTER: Grey, £24 to £25 per ton.

Methyl Acetone.—40/50%, £56 per ton.

Wood Creosote.—Unrefined, about 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. per gal.

Wood Tar.—£5 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%

Latest Oil Prices

LONDON.—August 23.—For the period ending September 2 (October 14 for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package: LINSEED OIL, crude, £62. RAPESEED OIL, crude, £85. COTTONSEED OIL, crude, £52 2s. 6d.; washed, £55 5s.; refined edible, £57; refined deodorised, £58. COCONUT OIL, crude, £49; refined deodorised, £49; refined hardened deodorised, £53. PALM KERNEL OIL, crude, £48 10s.; refined deodorised, £49; refined hardened deodorised, £53. PALM OIL, refined deodorised, £55; refined hardened deodorised, £58. GROUNDNUT OIL, crude, £56 10s.; refined deodorised, £58; refined hardened deodorised, £62 to £63. WHALE OIL, crude hardened, 42 deg., £51 10s.; refined hardened, 46/48 deg., £52 10s. ACID OILS: Groundnut, £40; soya, £38; coconut, and palm-kernel, £43 10s. ROSIN, 30s. 6d. to 45s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

General News——From Week to Week

Regulations covering the safety measures to be taken during shotfiring in ironstone mines are published as the Explosives (Stratified Ironstone Mines) Order 1944, S.R. & O., No. 945, made by the Minister of Fuel and Power. The Order comes into force on September 1.

A list of thirty antibiotics derived from moulds and bacteria is given in an article by Dr. Walter P. Kennedy published in the *Pharmaceutical Journal* of August 19. Nine of these are produced by *Penicillium spp.*, eight by *Aspergillus spp.*, six by Actinomycetes and seven by bacteria.

The offer by Lord McGowan, as chairman of Imperial Chemical Industries, of a gift of £4800 a year for seven years to establish eight research Fellowships of the average value of £600 a year in chemistry, physics, and certain other branches of science has been accepted by the Council of Liverpool University.

Iron and Steel Control of the Ministry of Supply has published a list, as Appendix D to the Iron and Steel Distribution Scheme, of the issuing authorities to whom applications for authorisations should be made. It is obtainable from Iron and Steel Control, Ashorne Hill, near Leamington Spa, Warwickshire.

The Board of Trade has, with the approval of the Treasury, decided that in respect of the period beginning September 3, and ending December 2, 1944, the rate of premium payable under any policy under the Commodity Insurance Scheme shall continue to be at the rate of 5/- per cent. for three months (or 1/8d. per cent. per month).

The world's largest penicillin factory is to be built in the North-West of England, and the total cost is expected to be about £1,000,000, says the *Manchester Guardian*. The press office of the Ministry of Supply found itself unable either to confirm or deny this story when THE CHEMICAL AGE inquired whether there was any truth in it.

The Ministry of Fuel announces the publication of the report of the Advisory Committee on the treatment and rehabilitation of miners in the Wales Region suffering from pneumoconiosis. The committee finds that present knowledge of the disease is scanty, and accordingly recommends the establishment of a research unit with accommodation for about thirty patients, equipped with facilities for clinical study and research. The work of this establishment should be linked with that proceeding on other phases of the problem, *e.g.*, the development in the pits of better methods of suppressing the dangerous dust. The report is published by the Stationery Office.

The Merchant Navy Comforts Service has received a donation of £25 from the Winnington and Wallerscote war charities committee of I.C.I. Alkali, Ltd., Northwich, which represents voluntary deductions made from the wages of the staff and workpeople, this being a further gift from this source to go towards providing books, games, etc. for merchant seamen.

There is little change of significance to record in the wholesale prices of chemicals or metals in July, according to the Board of Trade figures. Taking the 1930 figure as 100, non-ferrous metals and iron and steel remained steady at 128.0 and 183.4 respectively. Chemicals and oils fell 0.4 per cent. to 151.0, but the decrease was almost entirely due to the annual fall in the price of chemical fertilisers attributable to the rebate on deliveries taken early in the season.

The Anglo-American agreement whereby 10,000 tons of steel plates are being shipped each month from Britain to the United States has had the effect of utilising Britain's plate-rolling facilities to the best advantage of the common war effort, said Mr. N. W. Foy, director of the U.S. War Production Board's steel division, this week. According to a recent statement by the President of the Board of Trade, these exports consist of shipbuilding plates and the arrangement is a special and temporary one (see THE CHEMICAL AGE, August 5, p. 139).

The Industrial and Staff Canteen Undertakings Wages Board, which was recently established by the Ministry of Labour and National Service, has now been constituted. It consists of 15 persons to represent employers and 15 persons to represent workers, together with three independent members—Mr. William Gorman, K.C., Professor William Hamilton Whyte, and Miss Janet A. Kydd. Mr. Gorman has been appointed chairman of the board and Professor Hamilton Whyte deputy chairman. This wages board is the first to be established under the Catering Wages Act, 1943.

Standards for coffee essence and for coffee-and-chicory essence have been recommended by the Food Standards Committee, with a view to the ultimate issue of an Order. The recommendations include the provision that such essences should contain not less than 0.5 per cent. by weight of caffeine derived from coffee in the case of liquid coffee essence, or 0.25 per cent. in the case of liquid coffee-and-chicory essences; and that licences should not be granted for the manufacture of a coffee-and-chicory essence unless not less than 4 lb. of roasted coffee and chicory per gallon is used in the preparation.

Carbon disulphide and carbon tetrachloride are recommended by Dr. R. T. Leiper, of the Institute of Agricultural Parasitology (in a letter of *The Times*) as excellent alternatives for the scarce derris powder in the destruction of wasps. A dessertspoonful is poured into the entrance of the nest, and a wet turf placed over it.

A high speed cinematograph camera capable of taking 120 pictures at rates up to 1500 per second has been developed by Dr. D. S. H. Henry of the British Cotton Industry Research Association. The instrument, which is being used to study the movement of component parts of machinery such as looms, is described in the *Journal of Scientific Instruments*, August, 1944, p. 135.

A conference of M.P.s, scientists, economists, business men, and representatives of trade associations, presided over by Mr. Leslie Burgin in London on August 18, unanimously agreed on the need for a society having as its main object the scientific study of distribution. Plans now being drafted will be considered at a further conference in September. It is hoped to bring to distribution some of the benefits which in the past have fallen almost entirely upon production and manufacture. Information may be obtained from the acting hon. secretary, 1 Rodney Court, London, W.9.

Foreign News

The new alloy 75S, developed by the Aluminum Company of America after 18 years of research, is now in production.

Mercury-bearing ores and concentrates and metallic mercury are removed from List II of the United States General Imports Order.

Sweden's largest match concerns, the Jönköpings and Vulkan Match A.B. and the United Match Works, have merged.

An Indian Pharmacopoeial List is to be published as the official Indian supplement to the British Pharmacopoeia.

Sulphaguanidine is being manufactured in Australia in sufficient quantities for 50 lb. a week to be allotted to civilians.

Discovery of sulphahalidine, a new sulphonamide claimed to be the most effective intestinal antiseptic yet discovered, has been announced in the United States.

The Standard Chemical Co., Ltd., of Canada, reports a net profit of $39,771.62 ($55,250), equivalent to $1.06 per share, and is paying a final dividend of 50 c. per share, making $1 ($1.25).

New oil targets for the Allied air forces include a natural-oil refinery at Czechowice and a plant at Oswiecim, both west of Cracow, and a refinery at Dubova, in Slovakia, all of which were attacked for the first time on August 20.

A $5000 research project for the study of dielectric heating, a technique with wide application in moulding plastics, has been initiated at Illinois Institute of Technology by the Chicago Molded Products Co.

A special sub-committee of the U.S. Senate Agriculture Committee is to investigate the encroachment of rayon and other synthetic fibers into the cotton and wool fields, with particular attention to government-financed rayon plants.

The fruit of the Indian persimmon has a pectin content of about 50 per cent., it is stated in a letter published in *Science and Culture*, May, 1944. It is suggested that as the fruit is very abundant and cheap, it might provide a good commercial sizing material.

The United States produces about 95 per cent. of the world's supply of penicillin, it is stated in *Foreign Commerce Weekly*. Arrangements are being made for its export to European neutrals, the Middle East, India, New Zealand, Australia, S. Africa and the British West Indies.

Courtaulds, Ltd., are prepared to spend £5,000,000 to establish a factory in Australia to make rayon yarns, said Mr. W. Hermon Slade, chairman of Bonds Industries, Ltd., in the course of a speech he delivered in Sydney this week. The proposed factory, he added would need 5000 employees.

A roster of research scientists in India is being compiled by the recently-formed Industrial Research Planning Committee which is constituted under the auspices of the Council of Scientific and Industrial Research. Chairman of this committee is Sir R. K. Shanmukham Chetty, and Sir S. S. Bhatnagar is the Secretary, with Dr. A. L. Sundara Rao as his assistant.

Synthesis of sucrose from fructose and phosphorylated glucose has been announced by M. Doudoroff, H. A. Barker, and W. Z. Hassid, University of California, Berkeley. Using an enzyme from *Pseudomonas saccharophila*, frustose was made to combine with the glucose phosphate, producing sucrose with the elimination of a molecule of phosphoric acid. While the process is unlikely to have commercial value, it gives a general knowledge of the mechanism of sugar formation.

Issues of new capital amounting to £1,700,000 are being made by Roan Antelope Copper Mines and Mufulira Copper Mines, in order to provide, according to a statement by the directors of Roan Antelope, for expenditure on the properties in Northern Rhodesia and other purposes. These other purposes, according to the *Financial News*, are stated to be the provision of funds for post-war conditions, the need for substantial cash balances being recognised by the world's great copper mining concerns.

The Swedish Boliden Mines A.B. has started the exploitation of lead mines in Laisvall. The copper mines of Bjurfars are now exhausted, and in their stead the company is working the Adak-Lindsköld deposits. The company now produces aluminium from andalusite, having substituted this mineral for bauxite.

A method for reducing the oil loss in damp cottonseed by treating the seed with ammonia gas previous to storage has been developed in the Southern Regional Research Laboratory, U.S. Department of Agriculture, New Orleans. The treatment retards the formation of excessive and undesirable free fatty acids in the oil of stored seed, thus extending the period for storage without excessive deterioration. Large amounts of free fatty acids increase refining losses.

Interesting statistics about the American chemical profession are available in a census of chemists and chemical engineers based on figures released by the U.S. National Roster of Scientific and Specialised Personnel, which is equivalent to Britain's Central Register. Results of the census appear in *Chemical and Engineering News*, June 25 (p. 1004). On the roster there are 85,060 chemists, of whom 79,976 are men, and 5084 women. The total of 20,144 chemical engineers is made up of 20,073 men and 71 women. Approximately half of those listed are graduates.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

AIMEE LLOYD & CO. (1933). LTD. Tenterden, soap mfrs. (M.S., 26/8/44.) Sat'n Aug. 2, of debs. reg. Aug. 7, 1940, to the extent of £195 10/10.

Company Winding-up Voluntarily

UNITED WELDING PROCESSES, LTD. (C.W.U.V., 26/8/44.) Aug. 2 (members). R. Browning, 86 St. Vincent-st, Glasgow, C.2, appointed liquidator.

Company News

Boots Pure Drug Co., Ltd., are paying a first interim dividend of 10 per cent. (same).

Palestine Potash, Ltd., report a trading profit for 1943 of £194,855 (£294,383). Ordinary dividend, nil (same).

The United Glass Bottle Manufacturing Co., Ltd., is paying an interim dividend of 3½ per cent. (same).

Harold Wilson & Witco, Ltd., manufacturers of chemicals, colours, etc., have changed their name to Witco Chemical Company, Ltd.

Overseas Chemical Supply Company, Ltd., 118, Chancery Lane, London, W.C.2, has changed its name to Overseas Chemical Export Company, Ltd.

Leicester Varnish & Enamel Co., Ltd., 4 Horsefair Street, Leicester, has increased its nominal capital by the addition of £1500 in £1 ordinary shares, beyond the registered capital of £1000.

Low Temperature Carbonisation, Ltd., show a trading profit of £187,278 (£164,798), for the year ended March 31, and a credit balance, after all allowances, of £66,735 (£58,570). Ordinary dividend is 4 per cent. (same),

New Companies Registered

Line Development, Ltd. (389,173).—Private company. Capital: £10,000 in 10,000 shares of £1 each. Manufacturers of and dealers in fertilisers, insecticides, agricultural requisites, etc. Subscribers: A. W. Dean, Blean House, Roughton, Faversham, Kent (permanent director): L. F. Pulfer.

Jeyes' Laboratories, Ltd. (389,125).—Private company. Capital £100 in 100 shares of £1 each. Manufacurers of and dealers in chemical, pharmaceutical and medicinal preparations, etc. Subscribers: T. Blundell Brown; J. H. Nelson; F. W. Carter. Registered office: 13, Richmond Street, Plaistow, E.13.

Jackson Automatic Electric Controls Ltd. (389,229).—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturers of and dealers in instruments and appliances for the measurement, operation and control of liquids, gases, solids, etc. Directors: S. B. Jackson; Freda M. Haddy. Registered office: Windsor House, 46, Victoria Street, London, S.W.1.

Chemical and Allied Stocks and Shares

APART from continued firmness in British Funds, and speculative activity in European bonds, stock markets have been dull and inactive, with industrial shares showing a downward tendency. The war news and increased hopes of an earlier German collapse than seemed likely a short while back have again tended to centre market attention on the problems of the eventual return to peace-time working.

Imperial Chemical eased further to 39s. Turner & Newall were marked down from 85s. 9d. to 83s. 9d., while Lever & Unilever were 41s. 3d. compared with 42s. a week ago, and Wall Paper Manufacturers deferred 45s. 6d. compared with 47s. Declines, however, were again small in relation to the extent of the gains established in recent

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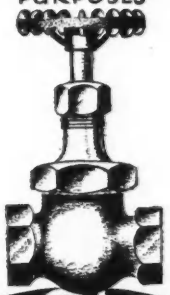

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months, and were attributed to falling off in demand, little selling being reported. British Aluminium were 51s. compared with 51s. 9d. a week ago, British Oxygen 88s. compared with 90s., while Borax Consolidated deferred reacted from 40s. 3d. to 39s. 9d. After rallying to 39s. on the report and accounts, United Molasses eased to 38s. 6d. The units of the Distillers Co. were 103s. 3d. compared with 106s. 3d. a week ago, and British Plaster Board moved down from 40s. 9d. to 38s. 3d.

B. Laporte were again firmly held and maintained at 85s., W. J. Bush at 66s., and Monsanto Chemicals 5½ per cent. preference at 23s. Cellon 5s. ordinary were maintained at 25s., and International Paint at 120s., but Pinchin Johnson moved back to 39s. 4½d. International Nickel eased on the profit figures. Iron and steel issues reflected the easier market tendency but declines on balance were mostly moderate, although Stewarts & Lloyds were 56s. 6d., a decline of 2s. compared with a week ago, and Tube Investments moved back to 97s. 6d. under the influence of the general trend of markets. Dorman Long were 28s., United Steel 25s. 3d., Guest Keen 39s., and Consett Iron 6s. 8d. units 8s. 4½d.

Among textiles Bradford Dyers reacted to 24s. although the view prevails that the dividend is likely to be improved to 5 per cent. for the year. Calico Printers were 17s., Lancashire Cotton 37s., and Fine Spinners 25s., although Bleachers at 12s. 3d. were slightly better on balance, as were the preference units of the last-named company. Allied Ironfounders eased to 49s. 9d., but elsewhere Amalgamated Metal were quite well maintained at 18s. 4½d., and British Match at 45s. 3d. were also a relatively steady feature. General Refractories held up well at 18s. 3d., aided by the assumption that profits and dividends may show an upward trend after the war. Gas Light & Coke ordinary were steady at 22s. 4½d. Low Temperature Carbonisation 2s. ordinary were maintained at close on 3s.

In other directions, reflecting the market trend, Dunlop Rubber yielded to 47s. 6d., and Triplex Glass to 43s. 6d. Boots Drug at 55s. 6d. were also down on balance, as were Sangers at 28s., Timothy Whites at 29s., and Beechams deferred at 19s. Burt Boulton were 24s. 6d., and British Drug Houses held their recent rise to 29s. Results of the latter company have not reflected expansion of business, because of the extent to which E.P.T. bears on earnings, but the general assumption is that dividends will in due course return at least to pre-war levels. Among shares of companies connected with plastics, De La Rue eased to 185s. Erinoid 5s. ordinary were 11s. 3d., and British Industrial Plastics 2s. ordinary 7s. 7½d. Barry & Staines moved back to 52s., and Nairn & Greenwich to 77s. 6d. Metal Box Co.'s shares were 93s. 9d. United Glass Bottle kept steady at 70s., maintenance of the interim dividend being in accordance with expectations. Earnings of the last-named company have for many years been well in excess of dividends paid, enabling the building-up of strong finances. Recognition of this is reflected by the moderate yield on the shares, as is the belief that dividends may move to a higher level after the war. Oil shares became reactionary, with Shell 83s. 1¼d., Burmah Oil 88s. 3d., and Anglo-Iranian 123s. 9d.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

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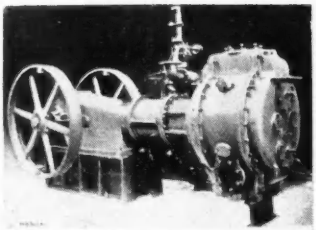

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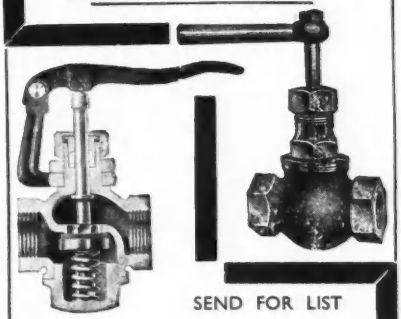

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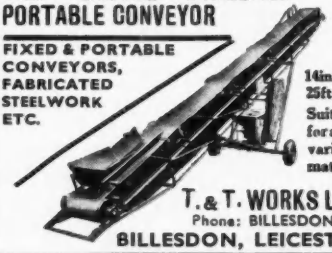

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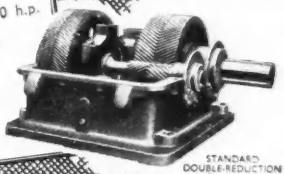

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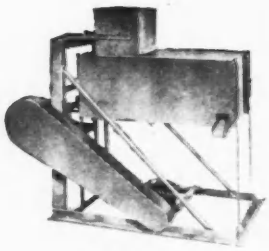

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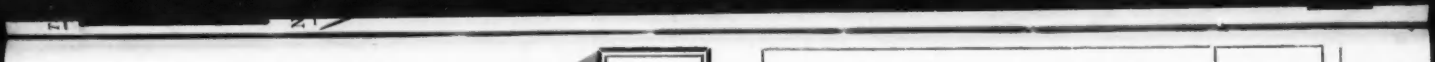
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